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(54) **Embossed fabrics and method of making the same**

Geprägte Geweben und Verfahren zu seiner Herstellung

Tissus gaufrés et procédé de fabrication

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Description

Background of the Invention

1. Field of the Invention

[0001] The present invention is directed toward endless fabrics, and more particularly, fabrics used as industrial process fabrics in the production of, among other things, wet laid products such as paper, paper board, and sanitary tissue and towel products; in the production of wet laid and dry laid pulp; in processes related to papermaking such as those using sludge filters, and chemiwashers; in the production of tissue and towel products made by through-air drying processes; and in the production of nonwovens produced by hydroentangling (wet process), melt blowing, spunbonding, and air laid needle punching. Such industrial process fabrics include, but are not limited to nonwoven felts; embossing, conveying, and support fabrics used in . processes for producing nonwovens; filtration fabrics and filtration cloths. The term "industrial process fabrics" also includes but is not limited to all other paper machine fabrics (forming, pressing and dryer fabrics) for transporting the pulp slurry through all stages of the papermaking process. Specifically, the present invention is related to fabrics of the variety that may be used to mold cellulosic fibrous web into a three-dimensional structure and in making nonwoven textiles.

2. Description of the Prior Art

[0002] During the papermaking process, a cellulosic fibrous web is formed by depositing a fibrous slurry, that is, an aqueous dispersion of cellulose fibers, onto a moving forming fabric in the forming section of a paper machine. A large amount of water is drained from the slurry through the forming fabric, leaving the cellulosic fibrous web on the surface of the forming fabric.

[0003] Typically, the newly formed cellulosic fibrous web proceeds from the forming section to a press section, which includes a series of press nips. The cellulosic fibrous web passes through the press nips . supported by a press fabric, or, as is often the case, between two press fabrics. In the press nips, the cellulosic fibrous web is subjected to compressive forces which squeeze water therefrom, and which adhere the cellulosic fibers in the web to one another to turn the cellulosic fibrous web into a paper sheet. The water is accepted by the press fabric or fabrics and, ideally, does not return to the paper sheet.

[0004] The paper sheet finally proceeds to a dryer section, which may include at least one series of rotatable dryer drums or cylinders, which are internally heated by steam. The newly formed paper sheet is directed in a serpentine path sequentially around each of the drums by a dryer fabric, which holds the paper sheet closely against the surfaces of the drums. The heated drums reduce the water content of the paper sheet to a desirable level through evaporation.

[0005] It should be appreciated that forming, pressing and dryer fabrics all take the form of endless loops on the paper machine and function in the manner of conveyors. It should further be appreciated that paper manufacture is a continuous process which proceeds at considerable speed. That is to say, the fibrous slurry is continuously deposited onto the forming fabric in the forming section, while a newly manufactured paper sheet is continuously wound onto rolls after it exits from the dryer section.

[0006] In the production of some paper products, such as paper towels, facial tissues and paper napkins, through-air drying for example replaces the press dewatering described above. In through-air drying, the newly formed cellulosic fibrous web is transferred from the forming fabric directly to an air-pervious through-air-drying (TAD) fabric.

[0007] Air is directed through the cellulosic fibrous web and through the TAD fabric to continue the dewatering process. The air is driven by vacuum transfer slots, hot-air blowers, vacuum boxes or shoes, predryer rolls and other components. The air molds the web to the topography of the TAD fabric, giving the web a three-dimensional structure.

[0008] After the cellulosic fibrous web is molded on the TAD fabric, it is transported to the final drying stage, where it may also be imprinted. At the final drying stage, the TAD fabric transfers the web to a heated drum, such as a Yankee drying drum, for final drying. During the transfer, portions of the web may be densified in a specific pattern by imprinting to yield a structure having both densified and undensified regions. Paper products having such multi-region structures have been widely accepted by consumers. An early TAD fabric, which created a multi-region structure in the web by imprinting the knuckle pattern of its woven structure thereon, is shown in U.S. Patent No. 3,301,746.

[0009] A subsequent improvement in TAD fabrics was the inclusion of a resinous framework on the woven structure of the fabric. TAD fabrics of this type may impart continuous or discontinuous patterns in any desired form, rather than knuckle patterns, onto the web during imprinting. TAD fabrics of this type are shown in U.S. Patents Nos. 4,514,345; 4,528,239; 4,529,480; and 4,637,859.

[0010] In addition, or as an alternative, to an imprinting step, the value of paper products manufactured using through-air drying may be enhanced by an embossing step, which adds visual appeal and contributes bulk, softness and extensibility to the web. The embossing step is often done as a final or near-final step, when the paper web is dry, in an embossing calender where the paper product passes through a nip formed by two rolls: one smooth and one with a patterned surface. The paper sheet will take on a degree of the pattern from the roll surface as it is pressed between the two rolls. Some

sheet thickness is lost however, which is undesirable.

[0011] In other applications, the fabric may be used in the formation and patterning of wetlaid, drylaid, meltblown and spunborided nonwoven textiles.

[0012] WO 98/27277 discloses a method of making a papermakers felt wherein ultrasonic energy is directed onto a batt of fibres on the surface of a fabric so as to at least partially melt the fibres provided on the surface of the fabric. A pattern is then imprinted into the batt whilst the fibres are in a molten state.

[0013] WO 91/02642 discloses a moulded paper clothing of a cast plastic grid with uniform drainage interstices bounded on all four sides by streamline shaped interstitial edges. Reinforcing strands are moulded into the grid-like clothing, the strands being of synthetic fibre or metal and are chosen to increase tensile strength and wear resistance.

[0014] EP 0285376 discloses a nonwoven fabric having knuckle-free planar surfaces comprising parallel linear machine direction yarns residing in a single plane. Cross-machine direction polymeric material also resides in the plane and substantially surrounds the machine direction yarns. The cross-machine direction material contains spaced apertures in the fabric. The invention is also directed to the method of producing such a nonwoven fabric.

Summary of the Invention

[0015] The present invention is an industrial process fabric designed for use as a forming, pressing, drying, TAD, pulp forming, or an engineered fabric used in the production of nonwoven textiles, which is in the form of an endless loop and functions in the manner of a conveyor. The fabric is itself embossed with the topographic features ultimately desired for the product to be manufactured. A method for embossing the fabric with the desired pattern is also disclosed.

[0016] The method for embossing the fabric envisions the use of a device having embossments thereon which are heated (or the fabric pre-heated) having two opposed elements between which the fabric may be compressed at preselected levels of compression for preselected time intervals. For example, the device may be a two-roll calender, one or both rolls of which may be engraved or etched, which allows for continuous embossing. A platen press, with upper and lower platens might also be used if the application warrants it.

[0017] An embossing medium is used which has a preselected embossing pattern, and is capable of being readily changed from one embossing pattern to another, for example, by changing the engraved calender rolls.

[0018] In addition, the embossing method provides versatility in making desired embossed fabrics for multiple applications. The properties of the desired embossed fabric depend upon the control of certain process variables under which embossing takes place and selection of fabric substrate. The process variables include time, temperature, pressure, gap setting and roll composition.

Brief Description of the Drawings

[0019] Thus the advantages of the present invention will be realized, the description of which should be taken in conjunction with that of the drawings wherein:

Figure 1 is an enlarged top plan view of an embossed forming fabric incorporating the teachings of the present invention;

Figure 2 is an enlarged sectional view of the embossed fabric shown in Figure 1;

Figure 3 is a top plan view of a paper sheet formed with an embossed forming fabric of Figure 1; the sheet was formed at a speed of 800 meters per minute with a sheet basis weight of 27 grams per square meter;

Figure 4 is a top plan view of a paper sheet formed with an embossed forming fabric of Figure 1 at a speed of 1200 meters per minute with a sheet basis weight of 16 grams per square meter; and

Figure 5 is a schematic cross sectional view of the embossing device which comprises a two roll calender.

Derailed Description of the Preferred Embodiments

[0020] Turning now more particularly to the drawings, Figure 1 shows a top enlarged view of an embossed fabric 10 which, by way of example, is a forming fabric used in papermaking. As aforesaid, the embossed fabric may also, however, be a press fabric, a dryer fabric, a TAD fabric, a pulp forming fabric, or an engineered fabric (i. e. a fabric used in making a nonwoven textile in the wetlaid, drylaid, meltblown and spunbonding process). Generally, each of these types of fabric 10 may be woven preferably from yarns extruded from a polymeric resin material, such as polyamide and polyester resin materials. A variety of yarns including multifilaments and monofilaments may be used. A variety of weave patterns, none of which are critical for the practice of the present invention, are used for this purpose, and, as is well-known to those of ordinary skill in the art, the fabrics may be of either single or multiple layers, woven or nonwoven, and can include batt fiber. Also, it is well-known that the permeability of the support fabric plays an integral role in the development of sheet properties, both physical and aesthetic.

[0021] As to the fabric 10 shown, square or diamond shaped elements 12 are embossed upon the fabric 10. This is a result of an in-plane deformation of the fabric 10 as shown in Figure 2. In this regard, the fabric 10 is deformed or compressed in area 14. One side 16 of the fabric 10 includes the embossment whereas the opposite side 18 remains flat. Embossment may be in-plane, as shown, or out-of-plane where the material of the fab-

ric 10 is displaced resulting in a raised portion on one side and a corresponding depression on the other side.

[0022] Turning briefly now to Figures 3 and 4, there is shown a plan view of a paper product produced using the embossed fabric 10 of Figures 1 and 2. The paper sheet 19 shown in Figure 3 was produced at a speed of 800 meters per minute with a sheet basis weight of 27 grams per square meter in the forming section of a papermaking machine. As can be seen, the embossment 12 in fabric 10 results in the appearance of diamond shaped patterns (darker spots) in the paper sheet.

[0023] Figure 4 illustrates a paper sheet 22 produced with the embossed fabric 10 at a speed of 1200 meters per minute and a sheet basis weight of 16 grams per square meter. Here also the embossment 12 in fabric 10 resulted in the appearance of diamond shaped patterns 24 in the sheet.

[0024] As can be seen, an embossed fabric forms a pattern in the material being formed. It should be noted that the invention envisions the use of the fabric so embossed in an endless loop. This endless loop operates in the manner of a conveyor rather than a dandy roll, calender roll, or other type of paper or textile embossing process.

[0025] Turning now to Figure 5 there is shown the preferred embodiment of the invention which allows the embossing process on the fabric to be carried out continuously by way of a two roll calender 30. While a calender is envisioned as a preferred method, the use of a platen press might also be used, if circumstances warrant.

[0026] As shown, a two-roll calender 30 is formed by a first roll 32 and a second roll 34. The calender (one or both rolls) may be engraved or etched to provide for the embossing.

[0027] The fabric 10 is fed into the nip 36 formed between the first and second rolls 32,34, which are rotating in the directions indicated by the arrows. The rolls 32,34 of the calender 30 are heated to the appropriate temperature. The rotational speed of the rolls 32,34 is governed by the dwell time needed for the fabric 10 to be embossed in the nip 36, the necessary force being provided by compressing the first and second rolls 32,34 together to the required level.

[0028] The present invention may be used to emboss forming fabrics for the manufacture of contoured paper sheets having a predetermined Z-direction topography in an approach alternative to embossing dry or semi-dry paper sheets during the papermaking process using a calender nip for example, and for the manufacture of planar sheets having a predetermined regular pattern of heavy and light sections, differing from one another in the quantity of fibers therein and the density of those regions also. Of course, as aforementioned, embossed press fabrics, dryer fabrics, TAD fabrics, pulp forming fabrics, and engineered fabrics are also envisioned. Fabrication of the fabrics may involve different paths and variables. In this regard, many alternative fabrics are envisioned, the production of which takes into account the process utilized, the variables involved, and the fabric to be embossed.

[0029] With reference to the process utilized, various alternates are available. The use of a two roll calender is contemplated as previously discussed. This may involve using two calender rolls both made of steel. One calender roll can be embossed with the other being smooth. Alternatively, one may be embossed i.e. a raised embossment (male) with the other having a matching inverse embossment in the female sense. Rather than using two steel calender rolls, one may be steel with the embossment thereon (or on a sleeve carried thereon), with the other having a softer polymeric cover which may be smooth or also have a pattern thereon.

[0030] The extent to which the fabric is embossed can be varied. It can be the full width of the fabric or any portion or segment thereof.

[0031] A heating or pre-heating of the fabric being embossed may be desirable and accordingly, a heating device may be utilized. This may be done, for example, by way of a hot-air oven, a heated roll which may be one or both rolls of the calender as aforementioned, infrared heaters or any other means suitable for this purpose.

[0032] Turning now to the fabric on which the embossment is to occur, such a fabric may be any fabric consistent with those typically used in current papermaking or nonwoven textile processes. The fabric is preferably of the type that has a woven substrate and may be a forming, press, dryer, TAD, pulp forming, or an engineered fabric, depending upon the particular application in which the fabric is to be utilized.

[0033] Other base support structures can be used, including a structure formed by using strips of material spiraled together as taught by U.S. 5,360,656 and 5,268,076. Also when used as a press fabric, staple fiber is applied to the base substrate on one or both sides of the substrate by a process of needling. Other structures well known to those of ordinary skill in the art can also be used.

[0034] The variables that ultimately control the formation of the fabric include the temperature of the rolls and fabric, the pressure between the rolls, the speed of the rolls, the embossing or roll pattern, and the gap between the rolls. All variables need not be addressed in every situation. For example, when employing a gap setting between the rolls, the resulting pressure between the rolls is a manifestation of the resistance to deformation of the fabric. The hydraulics of the machinery maintains the gap between the rolls. The rolls may have different temperature settings, and pre-heating of the fabric may or may not be used depending upon the circumstances involved.

[0035] The method described results in an altered topography and permeability of the resulting fabric. A pattern similar to the pattern of the embossing roll will be transferred to the fabric. This pattern may stem from in-plane deformation, where the nominal caliper of the fab-

ric remains constant and areas comprising the pattern are compressed. In this situation the fabric has a patterned side and a smooth side. The pattern could also result from out-of-plane deformation where the nominal fabric caliper has increased due to physical movement of material out of the original plane of the fabric. In this situation the pattern exists on both sides, with one side consisting of a protuberance with a corresponding cavity on the opposite side. In this situation compression may or may not occur.

[0036] Changes in permeability to fluid (air and water) of the fabric can be affected by carefully controlling the amount of compression in the patterned areas. High temperatures and pressures could ultimately result in fusion of the fibers in the embossed areas, completely sealing the areas. This would result in a "perm-no perm" situation. Compression to varying degrees without fusion could result in a situation where the permeability of the fabric in the embossed areas is less than the original permeability, but not reduced to zero. As the application warrants, the permeability in these areas could be altered over a range of desired values.

[0037] Thus it can be seen that through the selection of the process desired (and, of course, the elements to implement the process), controlling of the variables involved, and selecting the type of fabric to be embossed, the aforedescribed method provides for versatility in creating the desired embossed industrial process fabric.

[0038] Thus by the present invention its advantages are realized and although preferred embodiments have been disclosed and described in detail herein, its scope should not be limited thereby, rather its scope should be determined by that of the appended claims.

Claims

1. A method for embossing an industrial process fabric (10) in an endless loop which functions in the manner of a conveyor in making paper and paper related products or nonwoven textiles, said method comprising the steps of:

   providing a device having two opposed elements (32, 34) between which said fabric (10) may be compressed at a preselected level of compression for a preselected time interval;
   providing at least one of said two elements (32, 34) with an embossing medium having a preselected embossing pattern;
   providing an industrial process fabric (10) comprising a base support structure; and
   compressing said fabric (10) between said two opposed elements (32, 34) of said device at said preselected level of compression for a preselected time interval to emboss the base support structure of said industrial process fabric (10) with said preselected embossing pattern.

2. The method as claimed in claim 1 wherein said device is a two roll calender (30) having a first roll (32) and a second roll (34) with an embossing medium on at least one roll of the calender (30).

3. The method as claimed in claim 2 wherein said embossing medium comprises an engravement or etching on at least one roll (32, 34) of the calender (30).

4. The method as claimed in claim 3 wherein at least one roll (32, 34) of the calender (30) includes a polymeric roll surface.

5. The method as claimed in claim 3 wherein both rolls (32, 34) of the calender (30) are engraved or etched so as to provide embossments on both sides of the fabric (10).

6. The method as claimed in claim 3 wherein said rolls (32, 34) create in-plane deformation of the fabric (10).

7. The method as claimed in claim 5 wherein said rolls (32, 34) create out-of-plane deformation of the fabric (10).

8. The method as claimed in claim 1 which includes the step of heating the fabric (10) prior to or during embossing.

9. The method as claimed in claim 3 which includes the step of heating the fabric (10) prior to or during embossing.

10. The method as claimed in claim 1 which includes performing one or more of the following steps:

    controlling the speed of the calender (30);
    controlling the space of the gap between the rolls (32, 34); and
    controlling the temperature of the fabric (10).

11. The method as claimed in claim 1 which includes providing a fabric (10) having a woven substrate.

12. The method as claimed in claim 11 which includes providing a fabric (10) having a polymeric substrate.

13. The method in accordance with claim 1 which includes providing a fabric (10) having a polymeric substrate.

14. The method in accordance with claim 1 which includes a fabric (10), which is nonwoven.

15. The method as claimed in claim 1 which includes providing an industrial process fabric (10) which is selected from the following group: forming fabric, press fabric, drying fabric, TAD fabric, pulp forming fabric, or engineered fabric.

16. The method as claimed in claim 12 which includes providing a fabric (10) which is selected from the following group: forming fabric, press fabric, drying fabric, TAD fabric, pulp forming fabric, or engineered fabric.

17. The method as claimed in claim 3 wherein said first (32) and second rolls (34) are separated from one another at a gap formed therebetween to provide for a preselected compression of the fabric (10).

18. The method as claimed in claim 1 wherein said device is a platen press.

19. An industrial process fabric (10) in the form of an endless loop which functions in the manner of a conveyor in making paper and paper related products or nonwoven textiles, comprising:

    a substrate, comprising a base support structure, having a nominal thickness along a plane; a pattern embossed upon the substrate which is a result of a deformation of the base support structure of the substrate.

20. An industrial process fabric (10) according to claim 19, wherein the deformation is an in-plane deformation, wherein the base support structure of the substrate is compressed in the area defining the pattern, providing the substrate with a patterned side and an opposite relatively smooth side.

21. An industrial process fabric (10) according to claim 19, wherein the deformation is an out-of-plane deformation, wherein said nominal thickness of the substrate is increased in the area defining the pattern due to displacement of the base support structure of the substrate during embossing, and said substrate having a pattern on one side comprising a cavity with a corresponding protuberance on an opposite side as a result of the out-of-plane deformation.

Patentansprüche

1. Verfahren zum Prägen eines Industriegewebes (10) in einer Endlosschleife in der Art und Weise eines Förderers bei der Herstellung von Papier und von artverwandten Erzeugnissen oder Textilien aus Vliesstoffen, wobei das Verfahren die Schritte umfasst:

    Bereitstellen einer Vorrichtung mit zwei entgegengesetzten Elementen (32, 34), zwischen denen das Gewebe mit einem vorgewählten Grad von Druckbelastung über ein vorgewähltes Zeitintervall zusammengedrückt werden kann;

    Versehen wenigstens eines der beiden Elemente (32, 34) mit einem Prägemedium mit einem vorgewählten Prägemuster;

    Bereitstellen eines Industriegewebes (10) mit einer Grundtragstruktur; und Zusammendrükken des Gewebes (10) zwischen den beiden entgegengesetzten Elementen (32, 34) der Vorrichtung mit einem vorgewählten Grad von Druckbelastung über ein vorgewähltes Zeitintervall, um die Grundtragstruktur des Industriegewebes (10) mit dem vorgewählten Prägemuster zu prägen.

2. Verfahren gemäß Anspruch 1, wobei die Vorrichtung ein Zweiwalzenkalander (30) mit einer ersten Walze (32) und einer zweiten Walze (34) mit einem Prägemittel auf wenigstens einer Walze des Kalanders (30) ist.

3. Verfahren gemäß Anspruch 2, wobei das Prägemittel eine Gravierung oder Ätzung auf wenigstens einer Walze (32, 34) des Kalanders (30) umfasst.

4. Verfahren gemäß Anspruch 3, wobei wenigstens eine Walze (32, 34) des Kalanders (30) eine polymere Walzenoberfläche umfasst.

5. Verfahren gemäß Anspruch 3, wobei beide Walzen (32, 34) des Kalanders (30) graviert oder geätzt sind, um Prägungen auf beiden Seiten des Gewebes (10) bereitzustellen.

6. Verfahren gemäß Anspruch 3, wobei die Walzen (32, 34) Verformung des Gewebes (10) in der gleichen Ebene erzeugen.

7. Verfahren gemäß Anspruch 5, wobei die Walzen (32, 34) Verformung des Gewebes (10) in versetzter Ebene erzeugen.

8. Verfahren gemäß Anspruch 1, das den Schritt des Erwärmens des Gewebes (10) vor dem Prägen oder während des Prägens umfasst.

9. Verfahren gemäß Anspruch 3, das den Schritt des Erwärmens des Gewebes (10) vor dem Prägen oder während des Prägens umfasst.

10. Verfahren gemäß Anspruch 1, das die Durchführung eines oder mehrerer der folgenden Schritte

umfasst:

Steuern der Geschwindigkeit des Kalanders (30);
Steuern des Raumes des Spaltes zwischen den Walzen (32, 34); und
Steuern der Temperatur des Gewebes (10).

11. Verfahren gemäß Anspruch 1, das Bereitstellen eines Gewebes (10) mit einem gewebten Substrat umfasst.

12. Verfahren gemäß Anspruch 11, das Bereitstellen eines Gewebes (10) mit einem polymeren Substrat umfasst.

13. Verfahren gemäß Anspruch 1, das Bereitstellen eines Gewebes (10) mit einem polymeren Substrat umfasst.

14. Verfahren gemäß Anspruch 1, das ein Gewebe (10) umfasst, welches nicht gewebt ist.

15. Verfahren gemäß Anspruch 1, das Bereitstellen eines Industriegewebes (10) umfasst, welches aus der folgenden Gruppe ausgewählt wird: Siebgewebe, Pressgewebe, Trocknergewebe, TAD-Gewebe, Faserbrei-Siebgewebe oder technisches Gewebe.

16. Verfahren gemäß Anspruch 12, das Bereitstellen eines Gewebes (10) umfasst, welches aus der folgenden Gruppe ausgewählt wird: Siebgewebe, Pressgewebe, Trocknergewebe, TAD-Gewebe, Faserbrei-Siebgewebe oder technisches Gewebe,

17. Verfahren gemäß Anspruch 3, wobei die erste Walze (32) und die zweite Walze (34) voneinander um einen dazwischen ausgebildeten Spalt getrennt sind, um eine vorgewählte Druckbelastung des Gewebes (10) bereitzustellen.

18. Verfahren gemäß Anspruch 1, wobei die Vorrichtung eine Etagenpresse ist.

19. Industriegewebe (10) in der Form eines Endlosschleife, das bei der Herstellung von Papier und von artverwandten Erzeugnissen oder von Textilien aus Vliesstoff in der Art und Weise eines Förderers arbeitet, umfassend:

ein Substrat, umfassend eine Grundtragstruktur, mit einer Nenndicke entlang einer Ebene;

ein auf das Substrat geprägtes Muster, das das Ergebnis einer Verformung der Grundtragstruktur des Substrats ist.

20. Industriegewebe (10) gemäß Anspruch 19, wobei die Verformung eine Verformung in der gleichen Ebene ist, wobei die Grundtragstruktur des Substrats in dem das Muster definierenden Bereich zusammengedrückt wird, wodurch das Substrat mit einer gemusterten Seite und einer gegenüberliegenden relativ glatten Seite versehen wird.

21. Industriegewebe (10) gemäß Anspruch 19, wobei die Verformung eine Verformung in versetzter Ebene ist, wobei die Nenndicke des Substrats in dem das Muster definierenden Bereich aufgrund der Verschiebung der Grundtragstruktur des Substrats während des Prägens erhöht ist und wobei das Substrat im Ergebnis der Verformung in versetzter Ebene ein Muster aufweist, das auf einer Seite eine Vertiefung und auf einer gegenüberliegenden Seite eine entsprechenden Ausstülpung umfasst.

Revendications

1. Procédé de grainage d'un tissu (10) pour processus industriel selon une boucle sans fin qui fonctionne à la manière d'un convoyeur pendant la fabrication du papier et de produits analogues à du papier ou de textiles non tissés, ledit procédé comprenant les étapes consistant à :

fournir un dispositif ayant deux éléments opposés (32, 34) entre lesquels ledit tissu (10) peut être comprimé selon une quantité prédéterminée de compression pendant un intervalle de temps prédéterminé ;
fournir à au moins un desdits deux éléments (32, 34) un milieu de grainage ayant un motif de grainage présélectionné ;
fournir un tissu (10) pour processus industriel comprenant une structure de support de base ; et
comprimer ledit tissu (10) entre lesdits deux éléments opposés (32, 34) dudit dispositif à ladite quantité prédéterminée de compression pendant un intervalle de temps prédéterminé pour grainer la structure de support de base dudit tissu (10) pour processus industriel avec ledit motif de grainage prédéterminé.

2. Procédé tel que revendiqué dans la revendication 1, dans lequel ledit dispositif est une calandre (30) à deux rouleaux ayant un premier rouleau (32) et un second rouleau (34) avec un milieu de grainage sur au moins un rouleau de la calandre (30).

3. Procédé tel que revendiqué dans la revendication 2, dans lequel ledit milieu de grainage comprend une empreinte ou gravure sur au moins un rouleau (32, 34) de la calandre (30).

4. Procédé tel que revendiqué dans la revendication 3, dans lequel au moins un rouleau (32, 34) de la calandre (30) comprend une surface polymère de rouleau.

5. Procédé tel que revendiqué dans la revendication 3, dans lequel les deux rouleaux (32, 34) de la calandre (30) ont une empreinte ou une gravure de manière à fournir des grainages sur les deux faces du tissu (10).

6. Procédé tel que revendiqué dans la revendication 3, dans lequel lesdits rouleaux (32, 34) créent une déformation dans un plan du tissu (10).

7. Procédé tel que revendiqué dans la revendication 5, dans lequel lesdits rouleaux (32, 34) créent une déformation en dehors d'un plan du tissu (10).

8. Procédé tel que revendiqué dans la revendication 1, qui comprend l'étape consistant à chauffer le tissu (10) avant ou pendant le grainage.

9. Procédé tel que revendiqué dans la revendication 3, qui comprend l'étape consistant à chauffer le tissu (10) avant ou pendant le grainage.

10. Procédé tel que revendiqué dans la revendication 1, qui comprend la réalisation d'une ou plusieurs des étapes suivantes :

    contrôler la vitesse de la calandre (30) ;
    contrôler l'espace de l'interstice entre les rouleaux (32, 34) ; et
    contrôler la température du tissu (10).

11. Procédé tel que revendiqué dans la revendication 1, qui comprend l'étape consistant à fournir un tissu (10) ayant un substrat tissé.

12. Procédé tel que revendiqué dans la revendication 11, qui comprend l'étape consistant à fournir un tissu (10) ayant un substrat polymère.

13. Procédé selon la revendication 1, qui comprend l'étape consistant à fournir un tissu (10) ayant un substrat polymère.

14. Procédé selon la revendication 1, qui comprend un tissu (10) qui est non tissé.

15. Procédé tel que revendiqué dans la revendication 1, qui comprend l'étape consistant à fournir un tissu (10) pour processus industriel qui est choisi dans le groupe suivant : un tissu de formage, un tissu de pressage, un tissu de séchage, un tissu de séchage par air traversant (TAD), un tissu de mise en forme d'une pâte, ou un tissu pour dessin.

16. Procédé tel que revendiqué dans la revendication 12, qui comprend l'étape consistant à fournir un tissu (10) pour processus industriel qui est choisi dans le groupe suivant : un tissu de formage, un tissu de pressage, un tissu de séchage, un tissu de séchage par air traversant (TAD), un tissu de mise en forme d'une pâte, ou un tissu pour dessin.

17. Procédé tel que revendiqué dans la revendication 3, dans lequel lesdits premier (32) et second (34) rouleaux sont séparés l'un de l'autre selon un interstice formé entre eux pour fournir une compression prédéterminée du tissu (10).

18. Procédé tel que revendiqué dans la revendication 1, dans lequel ledit dispositif est une presse à plateau.

19. Tissu (10) pour processus industriel sous la forme d'une boucle sans fin qui fonctionne à la manière d'un convoyeur pendant la fabrication du papier et de produits analogues à du papier ou de textiles non tissés, comprenant :

    un substrat, comprenant une structure de support de base, ayant une épaisseur nominale selon un plan ;
    un motif embossé sur le substrat qui est le résultat d'une déformation de la structure de support de base du substrat.

20. Tissu (10) pour processus industriel selon la revendication 19, dans lequel la déformation est une déformation dans un plan, dans lequel la structure de support de base du substrat est comprimée dans la zone définissant le motif, en fournissant le substrat avec une face comportant un motif et une face opposée relativement lisse.

21. Tissu (10) pour processus industriel selon la revendication 19, dans lequel la déformation est une déformation en dehors d'un plan, dans lequel ladite épaisseur nominale du substrat est augmentée dans la zone définissant le motif du fait du déplacement de la structure de support de base du substrat pendant le grainage, et ledit substrat ayant un motif sur une face comprenant une cavité correspondant à une protubérance sur la face opposée à la suite de la déformation en dehors d'un plan.

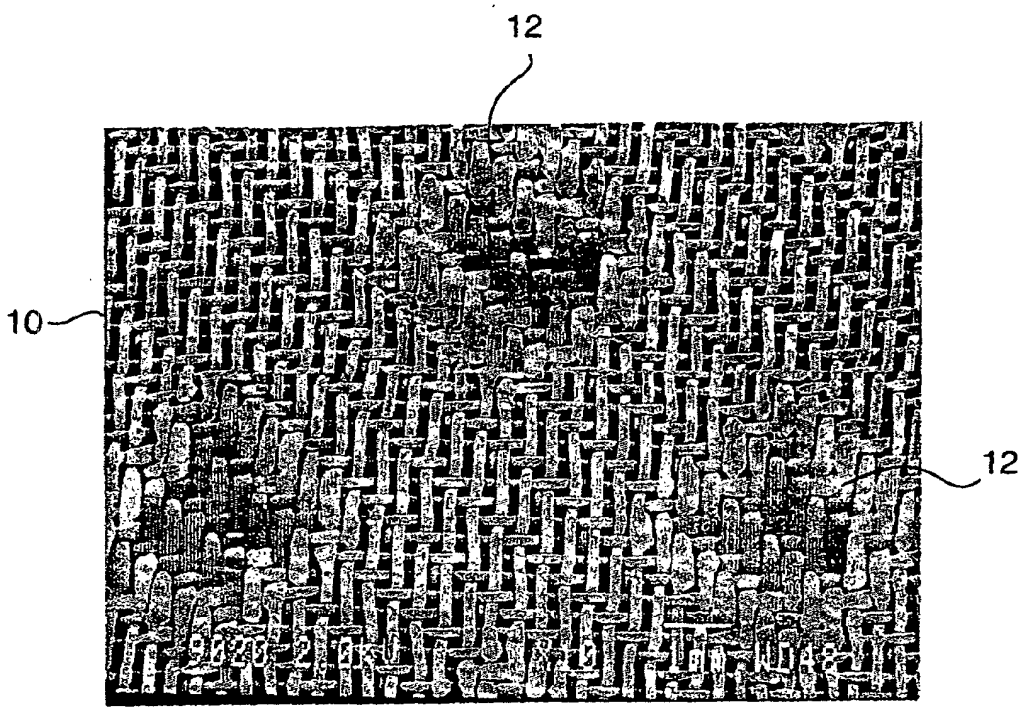

Fig 1

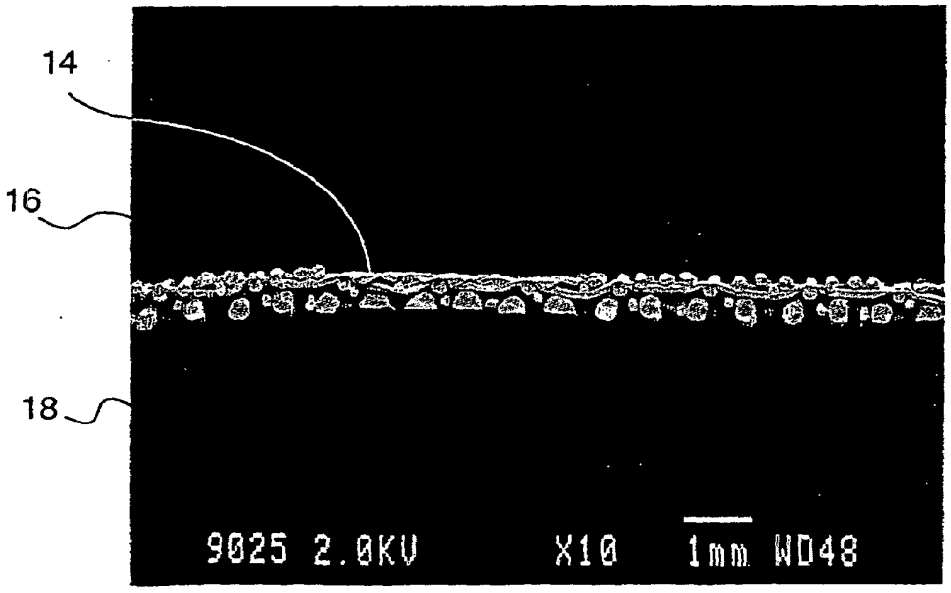

Fig 2

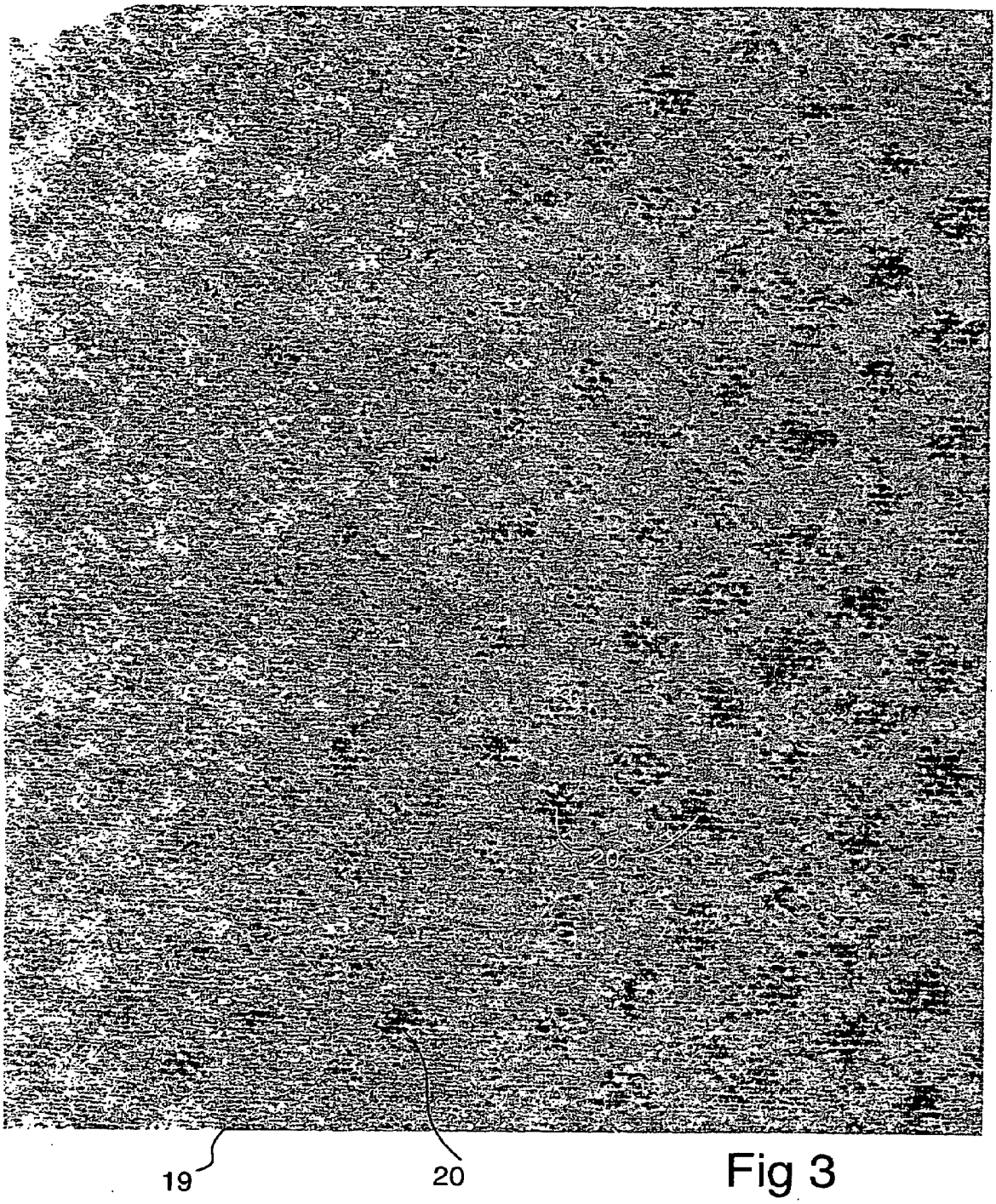

Fig 3

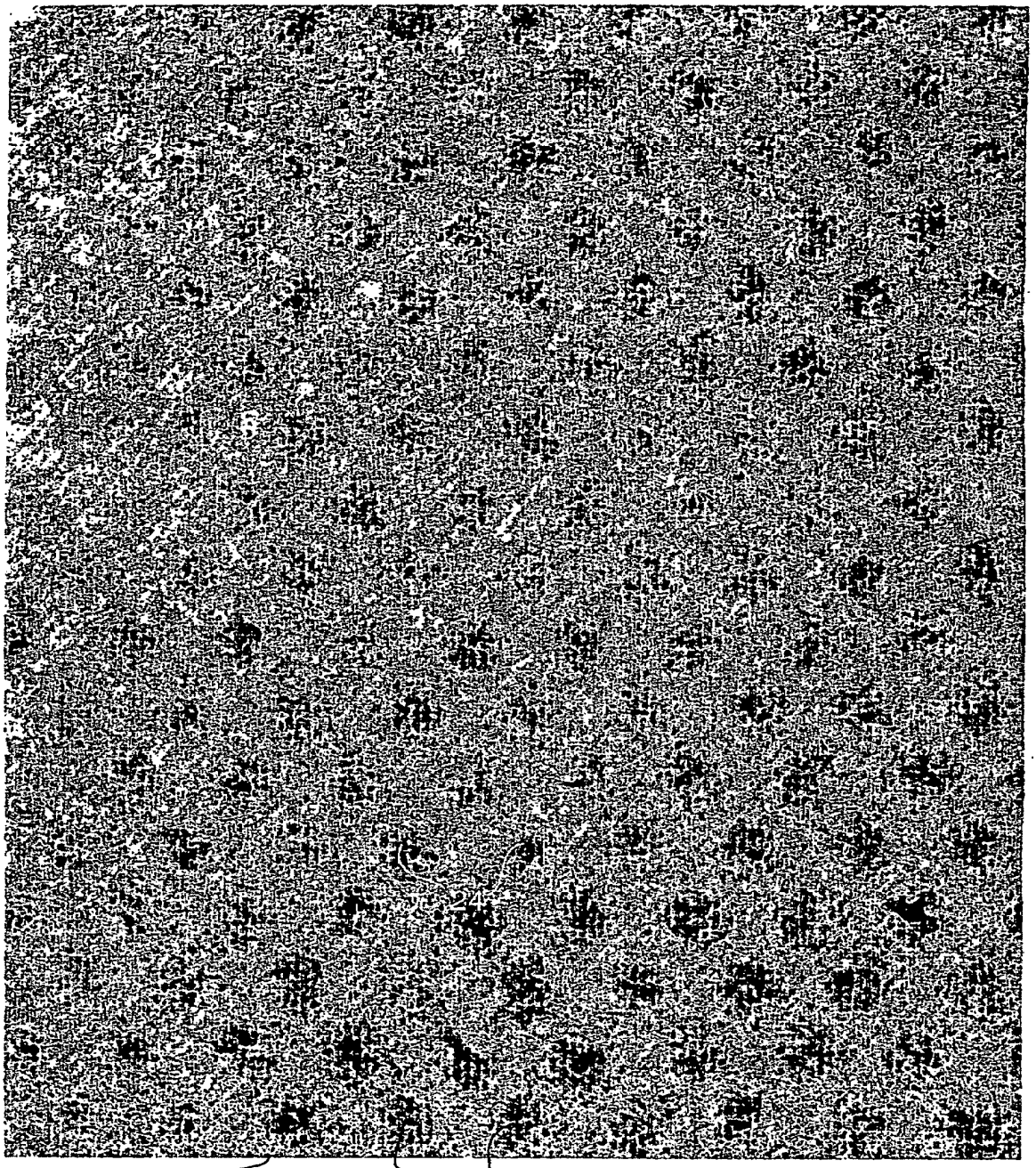

Fig 4

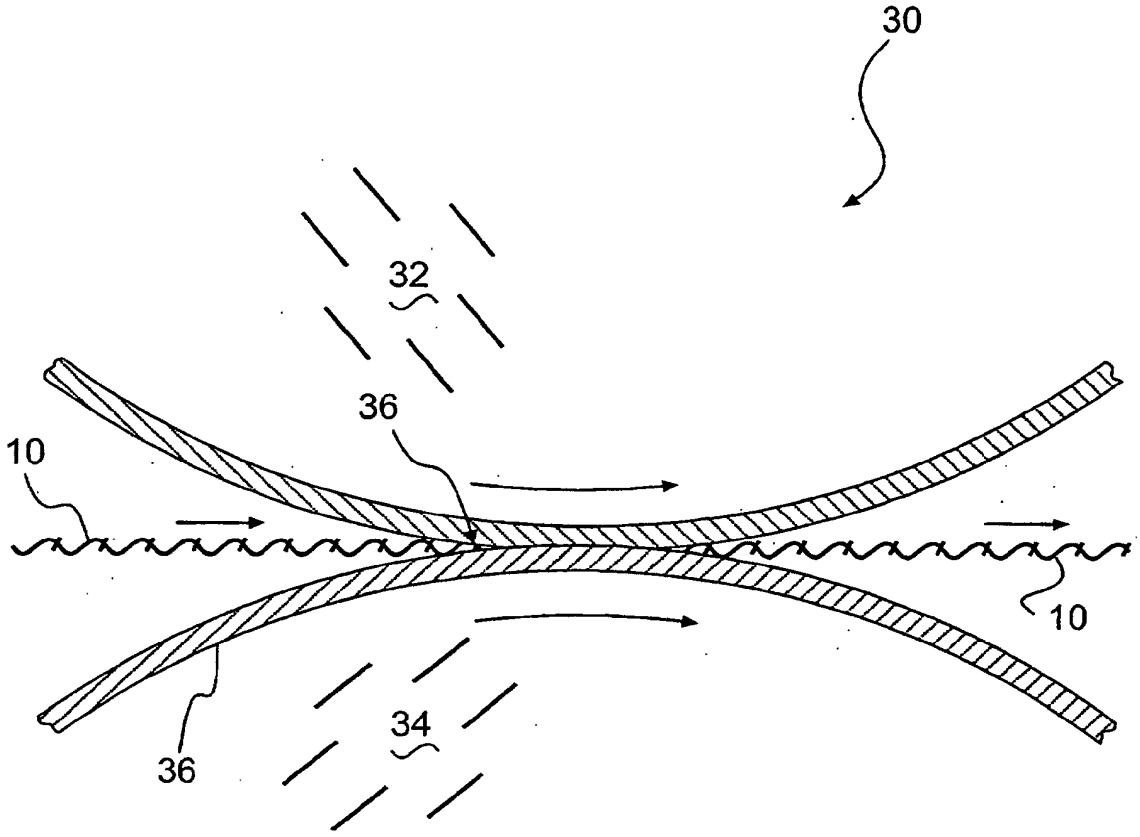

Fig 5